

Particle Non-sphericity in the OMI Aerosol Retrieval Using the Multi-wavelength Algorithm

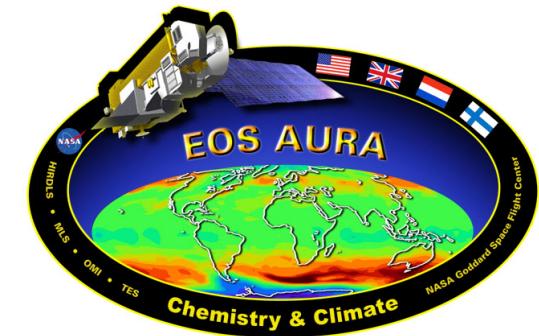
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P.F. Levelt, J.F. de Haan

Royal Netherlands Meteorological Institute



Aura Science Team Meeting
Pasadena, CA, USA, 2007



Overview

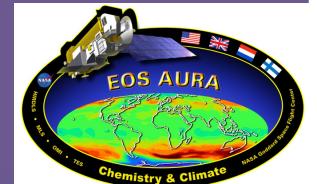
- Multi-wavelength algorithm aerosol retrieval
- Retrieval strategy
- Particle non-sphericity
- Impact on retrieved AOT
- Conclusions



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OMI aerosol algorithms

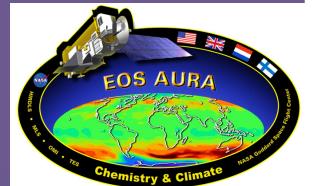
- Multi-wavelength algorithm (OMAERO product)
 - 14 wavelength bands, 1 nm broad
 - Aerosol Optical Thickness (AOT)
 - best fitting aerosol model (out of 50 models)
 - main type: Biomass Burning / Desert Dust / Weakly Absorbing / Volcanic
 - refractive index → Single-Scattering Albedo (SSA)
 - height
 - size distribution
 - Aerosol Indices (AI): AI_{UV} , AI_{vis}
- Near-UV algorithm (OMAERUV product)
 - 2 wavelength bands in UV, TOMS heritage
 - AOT, AI, absorbing AOT



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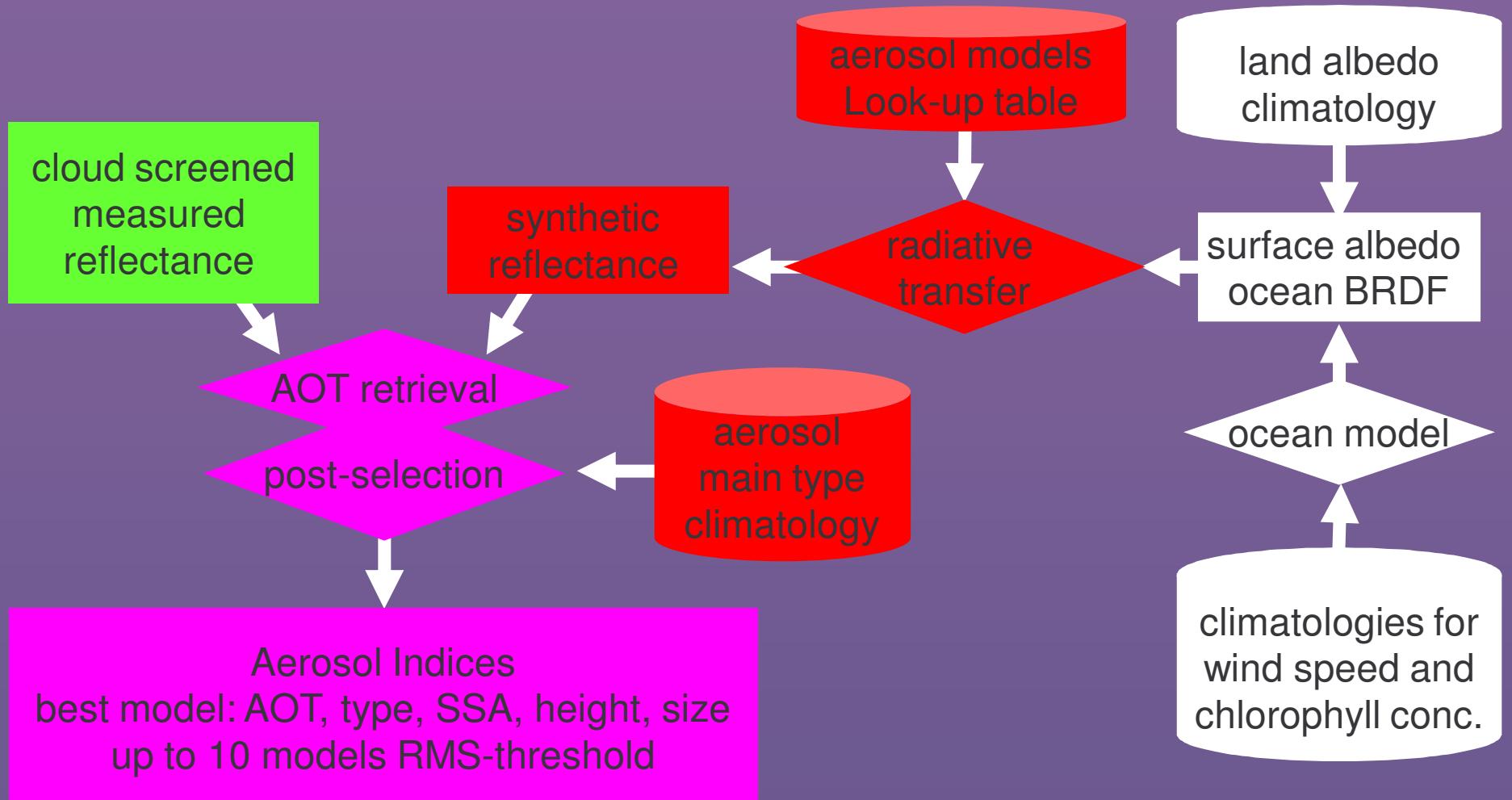
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Multi-wavelength algorithm

Retrieval strategy



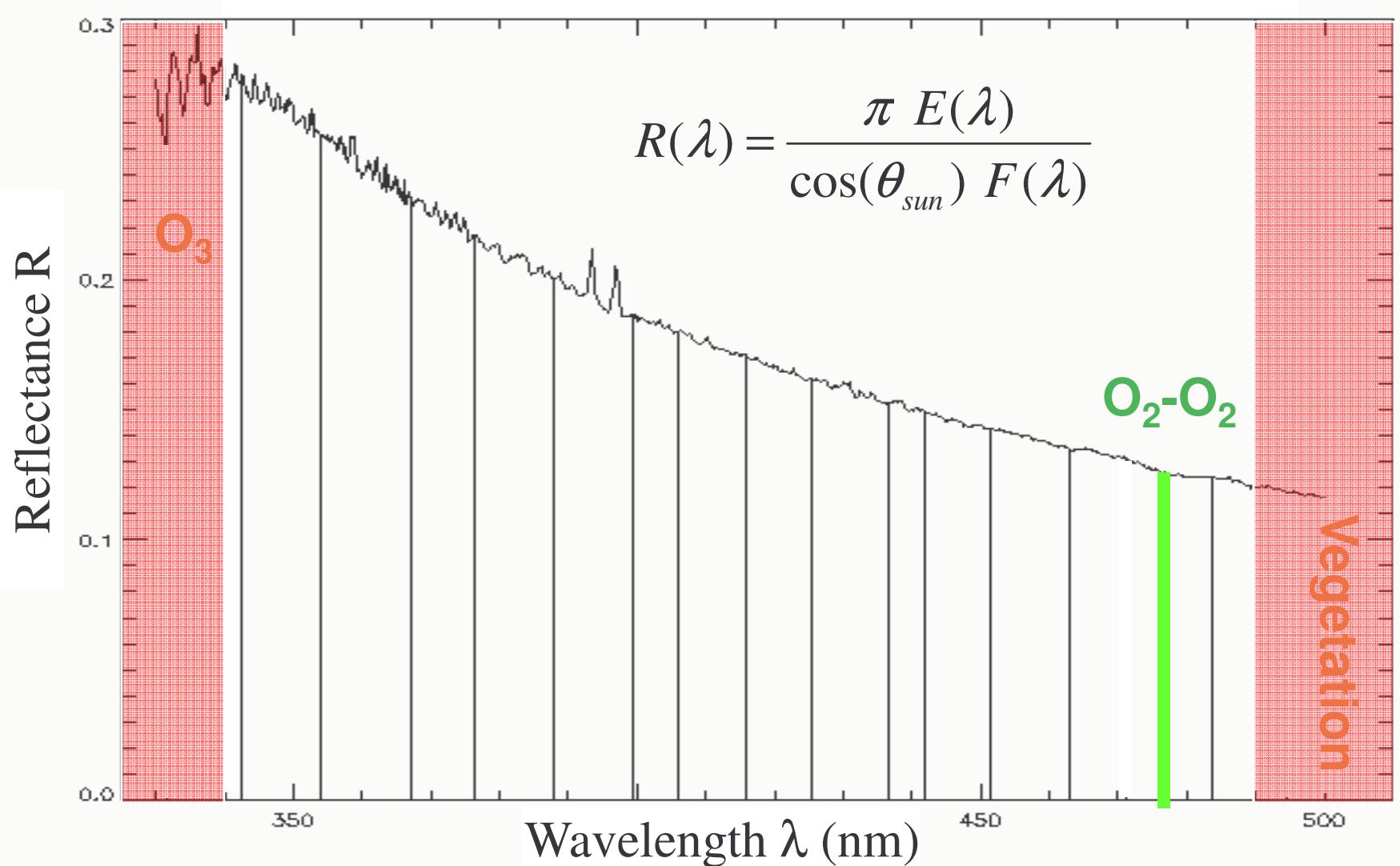
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Wavelength bands



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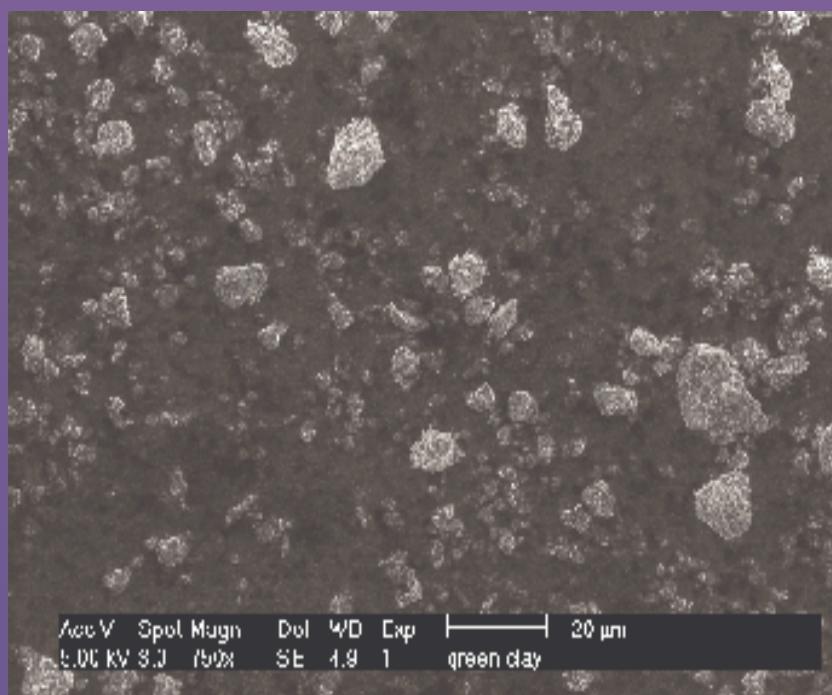
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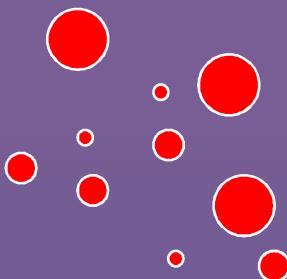


Non-sphericity of desert dust

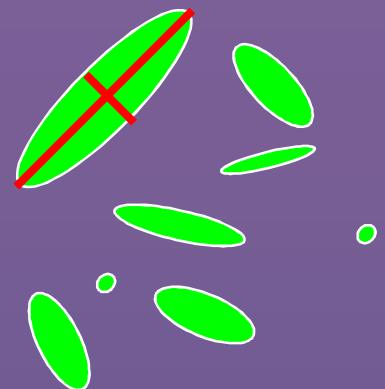
Microscope image of mineral dust sample



Modelling single-scattering properties
using volume-equivalent size dist of
spheres spheres spheroids

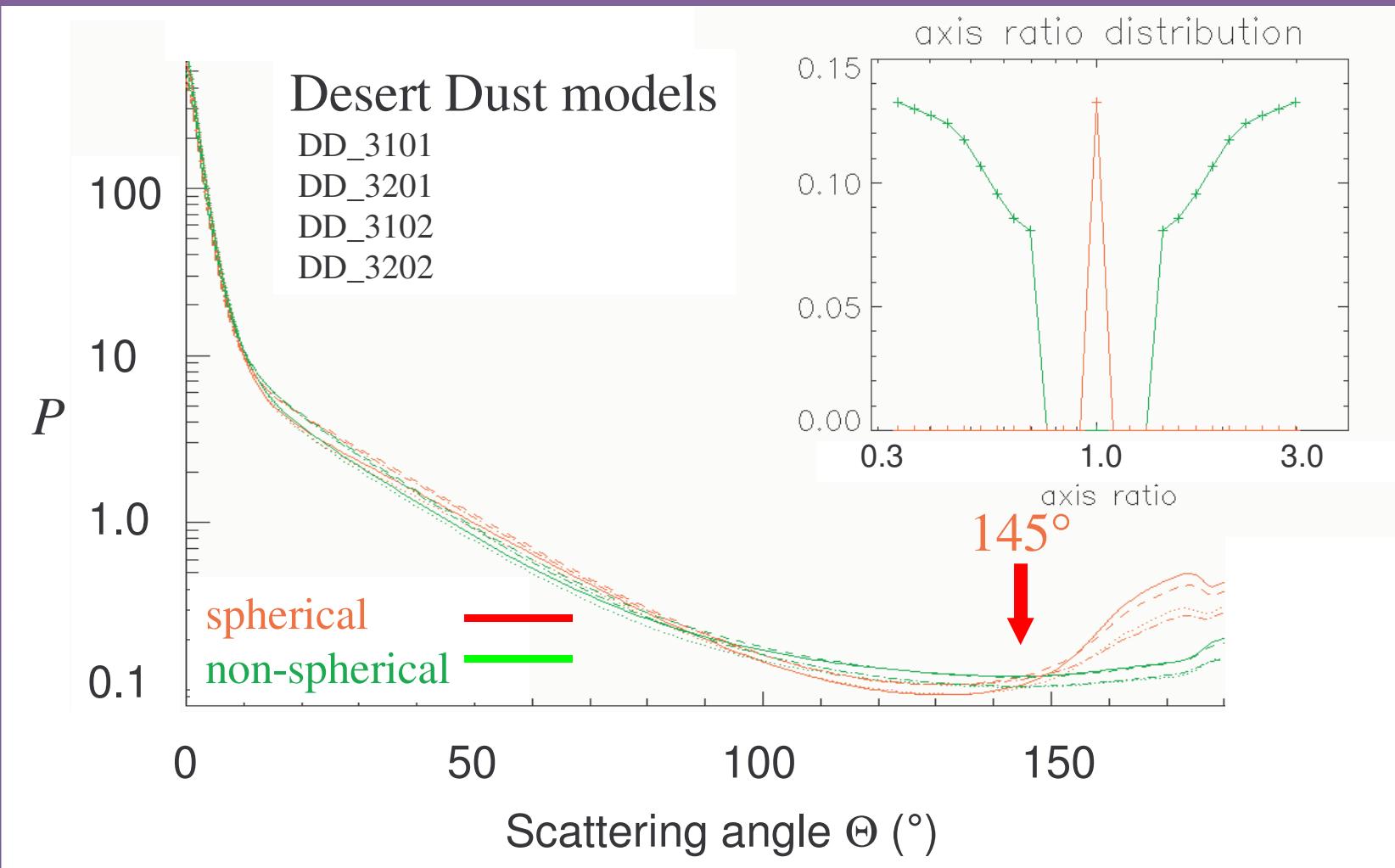


Mie



T-matrix
& Geometrical Optics

Phase function $P(\Theta)$



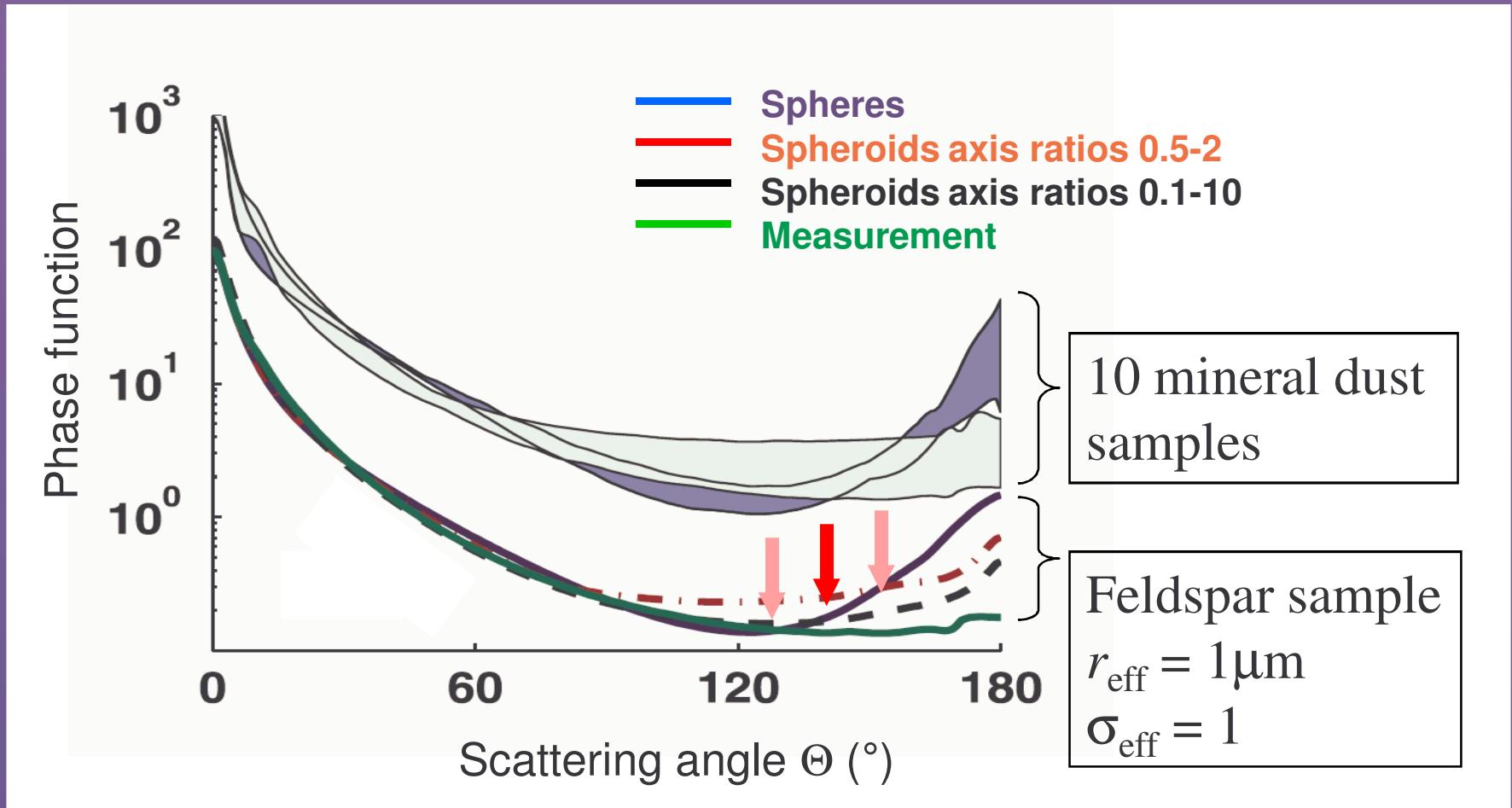
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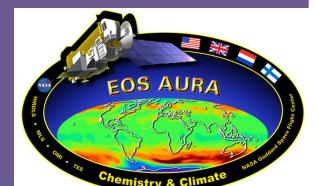
Simulated and measured phase functions of irregularly shaped aerosol samples

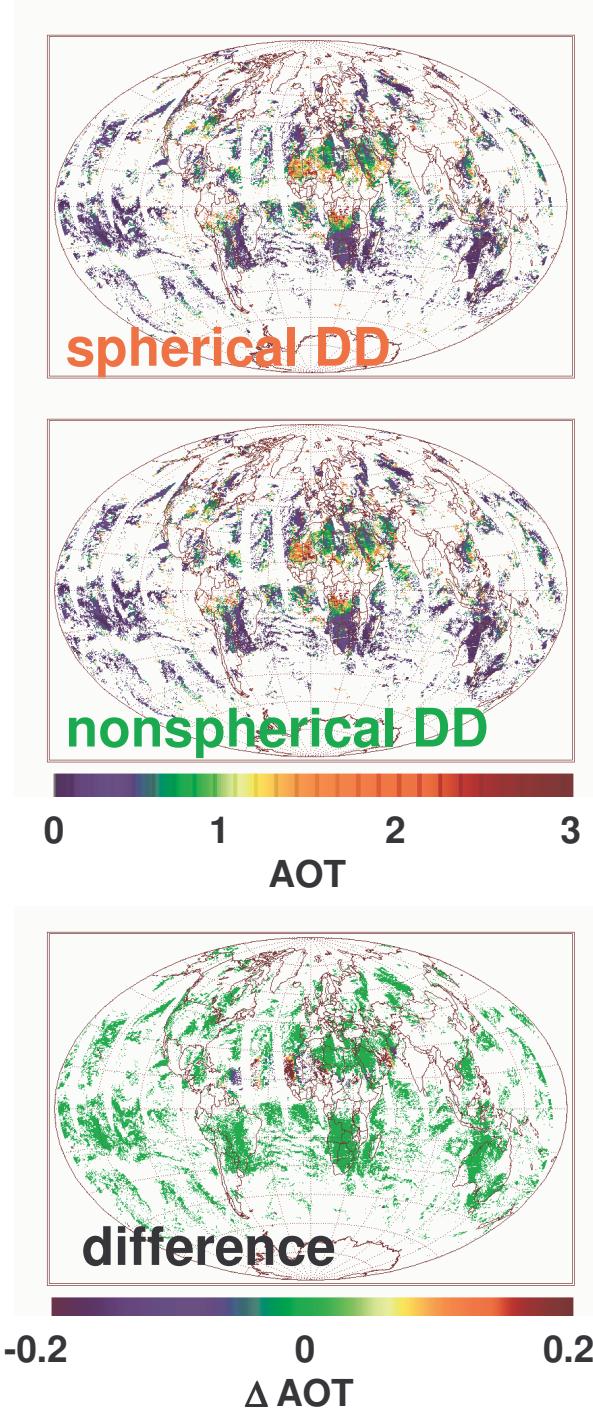


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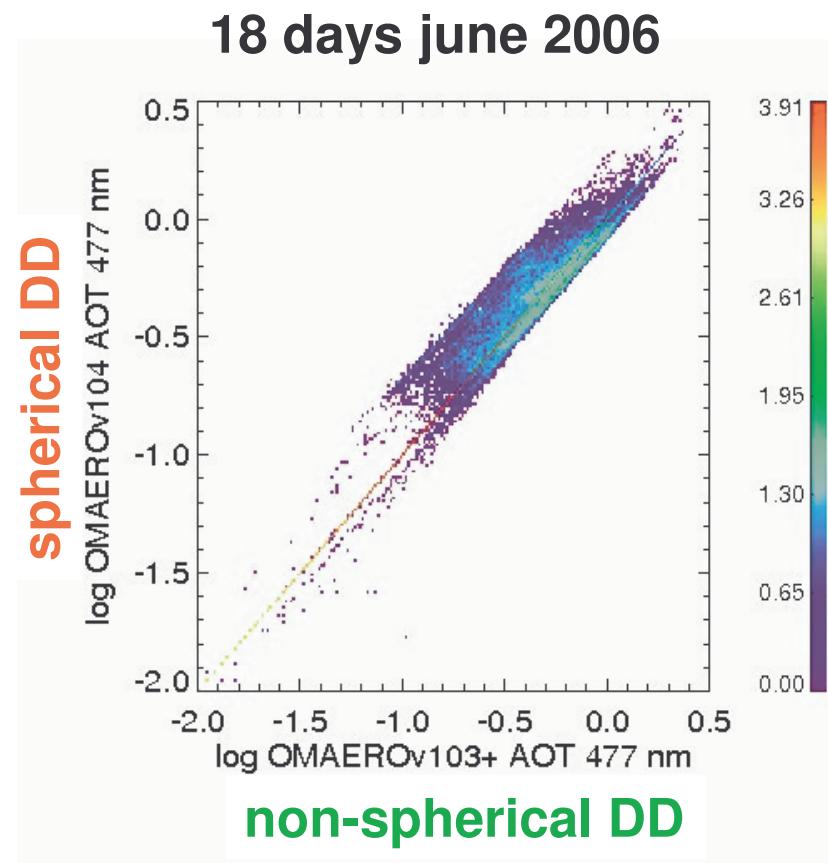
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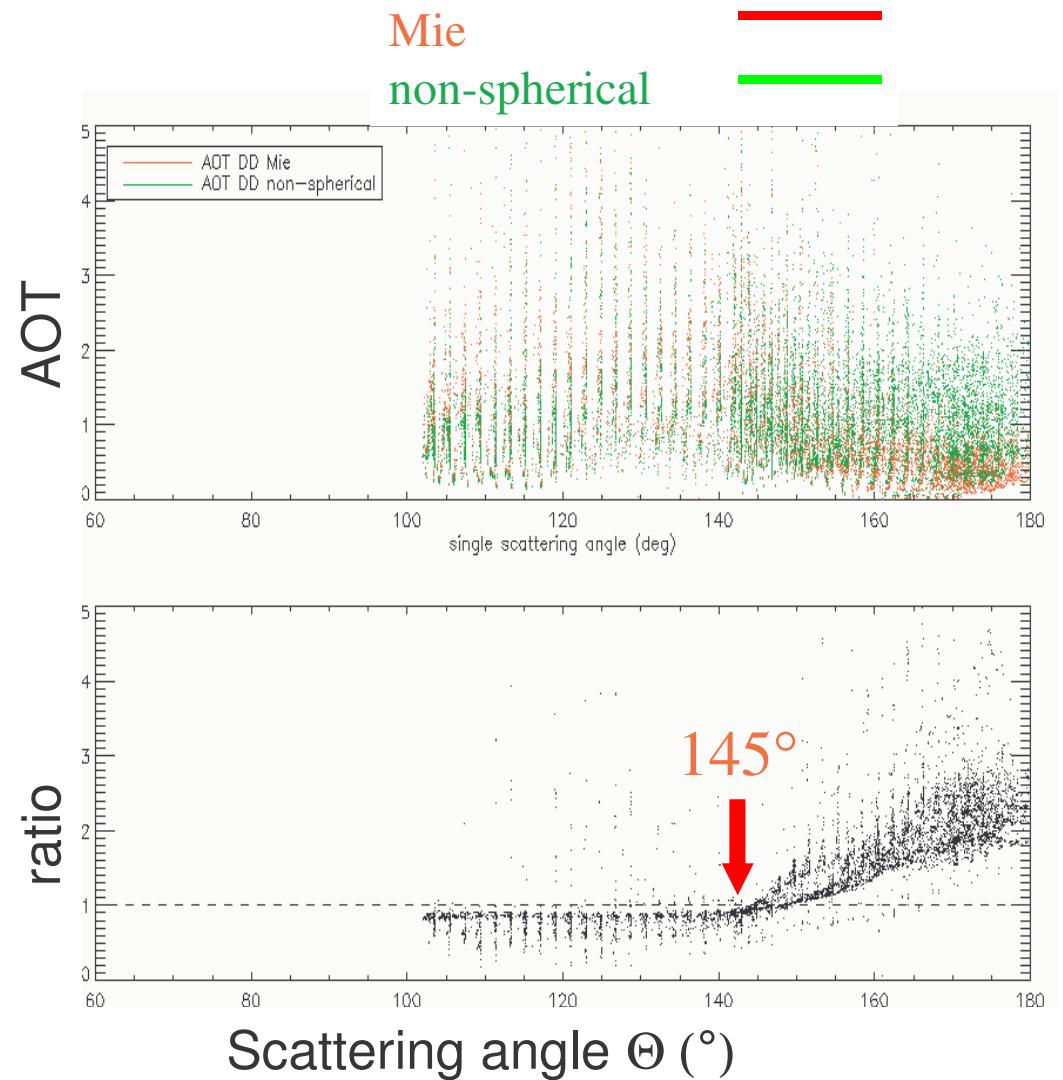
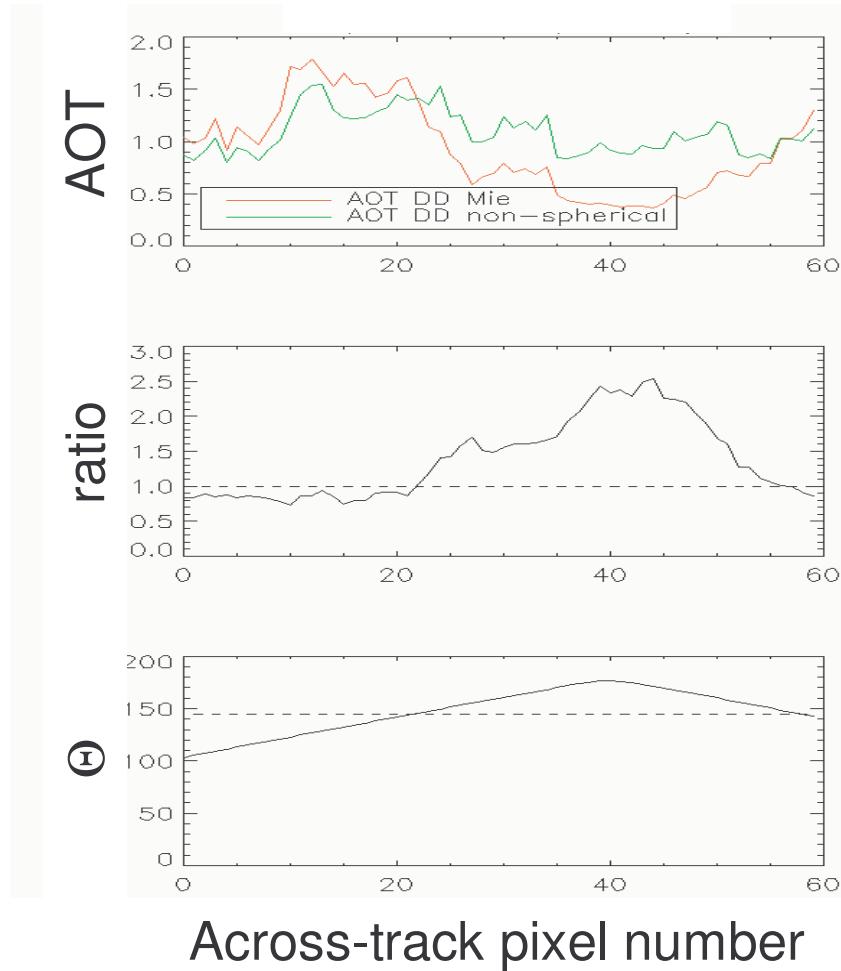


Impact of non-sphericity on AOT



Impact of non-sphericity on AOT

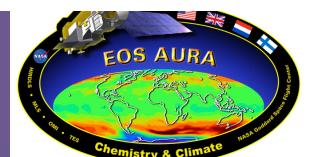
$$R \sim P(\Theta) \cdot AOT$$



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Conclusion

- non-spherical desert dust aerosol models
using spheroidal shapes,
 T -matrix and geometric optics simulations
- across-track distribution of AOT
sensitive to particle shape, phase function
artifact reduced using non-spherical models
- global average AOT slightly reduced



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